

SOME PELAGIC POLYCHÆTA NEW TO THE WOODS HOLE FAUNA.

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The pelagic annelid fauna of southern New England has received but little attention and, with the exception of larval forms, some Sillidæ and the epitokous phases of some nereids, etc., practically nothing relating to it has been recorded. With the exception of *Tomopteris* all of the genera discussed in the following pages are new to the region.

***Amphinome pallasii* Quatrefages.**

From several logs covered with goose barnacles (*Lepas anatifera*) which came ashore in Vineyard Sound on August 4 and 5, 1903, a large number of examples of this species were taken. Most of them measured from 2 to 2½ inches in length, and their size and peculiar bluish-brown color served to conceal them admirably among the stalks of the barnacles and in the crevices to which they clung. Several were observed to squeeze between the valves of barnacles and to feed on their soft parts, and the digestive tracts of others were filled with a soft pasty substance apparently composed of the tissues of those animals.

There can be no doubt that these specimens are of the species described and figured under the above name by Ehlers in his *Florida Anneliden*, and which is probably a regular Gulf Stream waif. Under the name of *A. rostrata* (Pallas) McIntosh¹ describes an *Amphinome* taken from a floating log near the Bermudas. From his description the Woods Hole specimens differ most obviously in having the short notopodial setæ with serrated tips more slender instead of stouter than the longer notopodial setæ, and in the different form of the terminal knobs of the very short spines. The shape of the cephalic earuncle and the arrangement of the setæ also present slight divergences, but in all other respects the resemblance is very close. Prof. McIntosh apparently considers the two species identical.

***Hipponoe gaudichaudi* Aud. and M. E.**

On the same floating logs that yielded the *Amphinome* were found many fine examples of this species, which agree perfectly with the original description and with McIntosh's² detailed account and figures.

¹ *Challenger Reports*, XII, p. 21.

² *Challenger Reports*, XII, p. 30

Unlike the *Amphinome*, most of these were found on the under side of the logs away from the light, associated with crabs and nudibranches, and less frequently among the barnacles on the sides and upper surface. By means of their strong neuropodial hooks they cling most tenaciously and move very sluggishly. The larger ones were of a deep orange-red color, due to the great number of small spherical ova with which the body wall was distended, and the expulsion of which caused the color to quickly fade.

Again, unlike the *Amphinome*, which is a common annelid in the littoral zone of the West Indies, this species probably finds its normal habitat on floating objects. The original examples of Audouin and Milne-Edwards³ came from Port Jackson, while the *Challenger* took the species in the Atlantic Ocean, 100 miles north of Bermuda, and also in the North Pacific, in one case attached to a log and in the other among masses of *Lepas fascicularis* floating at the surface. Baird⁴ also notes that the British Museum contains specimens taken amongst barnacles on a floating log near Madeira, and others from within the valves of *Lepas fascicularis* from near St. Helena.

***Drieschia pellucida* n. sp.**

This is a slender species, the single representative of which has a total length, including the protruded proboscis, of 14 mm., a maximum breadth of body of about 1 mm., a width between the tips of the parapodia of 2.8 mm. and between the ends of the longest setae of 6 mm.

The prostomium (Pl. LV, fig. 1) is of the *Lepidonotus* type, is $\frac{2}{3}$ as long as broad, regularly convex laterally, slightly concave posteriorly and deeply cleft anteriorly to accommodate the ceratophore of the median tentacle, on each side of which the frontal prolongations reach nearly to the same distal level; a broad shallow median depression reaches almost to the posterior margin. The eyes are rather small, circular and black, and because of the beautifully transparent tissues very conspicuous; they are well separated on the sides of the head, the anterior pair at the place of its greatest width and the posterior close to the postero-lateral angles and about twice their own diameter from the anterior eyes. The style of the median tentacle is lost. As in *Lepidonotus*, the lateral tentacles arise directly from the frontal processes without any distinct ceratophores; they are about $1\frac{1}{2}$ times the length of the head, very slender and taper regularly to acute points without any subterminal enlargement or terminal filament. The palpi are widely separated at their origin beneath the sides of the prostomium,

³ *Ann. Sci. Nat.* (1), XX (1830), p. 159.

⁴ *Jour. Linn. Soc. Lon.*, X (1868), p. 239.

rather stout at the base, tapered gradually to the terminal fourth and then rapidly to a short filamentous tip; they are about twice the length of the head, and the dorsal surface is marked by two longitudinal ciliated lines. No setæ occur on the buccal parapodium. The ceratophores of the tentacular cirri reach beyond the prostomium; their styles are subequal, more than 4 times the length of the head, slender and regularly tapering to fine tips. Crowded between the bases of the tentacular cirri, the prostomium and first elyptrophore on each side is a small ovate lobe. The protruded proboscis measures 1.5 mm. long and .7 mm. wide, is nearly terete and bears 13 acute ovate papillæ (fig. 6) above and a like number below. Just proximad of these is a circular ridge, terminating on each side in a small prominence. No peculiarities are presented by the interlocking fang-like jaws.

Besides the peristomium and pygidium there are 25 very distinct setigerous somites in the slender elongated body (fig. 1), which tapers very gently both ways but quite rapidly near the pygidium. Owing to the very delicate musculature the body walls are thin and inflated and so transparent that even in the alcoholic specimen the entire arrangement of the parapodial muscles is distinctly visible. Except a few at each end, all of the somites are partially biannulate through a cross-furrow just anterior of the parapodia. No nephridial papillæ are visible. The small truncated pygidium is slightly annulated, as though composed of several somites, and bears a pair of minute caudal styles above the somewhat dorsally directed anus.

All of the 25 pairs of setigerous parapodia (figs. 2-5) are uniramal, consisting of neuropodia alone. They are elongated and prominent, those of the middle region very nearly equaling the width of the body. Of a nearly cylindrical form, they are somewhat enlarged at the end, where they terminate in a longer, more pointed presetal process and a shorter, thicker postsetal process, which is rendered slightly less transparent than the rest of the organ by a small aggregation of gland cells. Toward the ends of the body the parapodia diminish in size, and the last one is a mere short, cylindrical tubercle. Ventral cirri occur on all parapodia. They arise from the middle of the ventral surface and are always slender and regularly tapered; on a few of the anterior somites they reach to the tip of the parapodia, but typically are only $\frac{1}{3}$ as long as their parapodium.

The dorsal cirri (Pl. LV, figs. 1, 2, 5) are borne on all parapodia not occupied by elytra, and because of their unequal development are very characteristic. Each springs from a slight elevation of the body wall above and slightly caudad of the parapodium. The ceratophores

are subcylindrical, but are somewhat constricted at the base and tapered more or less distally, thin-walled and hollow, with less transparent integuments than the body. Typically they are of large size, many of them much exceeding their parapodia, which they may totally conceal from above. The second (on somite VI) is the largest, being twice as long and much thicker than the corresponding parapodium. The next two are successively slightly shorter; and from this point to near the posterior end large and small cirri regularly alternate, short ones whose ceratophores barely equal the parapodia occurring on XII, XVI and XX, long ones with ceratophores much exceeding the parapodia on XIV and XVIII, that of XXII, though of reduced size, also belonging to the latter group by reason of its long style. On XXIV the dorsal cirri are greatly reduced. The styles are slender and tapering to the ends, those of the larger cirri being whip-lash-like and from $1\frac{1}{2}$ times to twice the length of the ceratophores, and the smaller ones little exceeding their ceratophores and apparently more rigid. The style on XXIV is conical, that of XXV short ovate. Whether somite XXVI bears a cirrus or an elytron is uncertain, as only a small tubercle is present.

Twelve pairs of elytriphores occur on somites II, IV, V, and then on every alternate somite to XXIII inclusive, and the small tubercle on XXVI may possibly indicate a thirteenth. The elytriphores are remarkable for their length and slenderness (figs. 3 and 4). In the alcoholic specimen they are much contracted, as indicated by the wrinkles, furrows and nodules upon their surfaces, particularly of the last two. When the specimen was first taken they were extended, and the parapodia were raised high above the body. The elytra are attached near the middle by a very limited area, and are readily detached. They are perfectly plain and smooth, without papillæ, cilia or processes of any kind, or any pigment. Instead of having the usual scale-like form, the elytra, when the specimen was taken from the tow-net and still alive, were inflated and spherical, being mere thin-walled vesicles filled with fluid, but certainly entirely closed and without any communication with the cœlom. That this condition may have resulted from rough handling in the net is possible, but seems improbable from the fact that every elytron is in the same condition. An area surrounding the scar of attachment is finely granular; elsewhere the elytron is perfectly transparent. A large part of the back is exposed, the elytra having the aspect of a series of floats attached along its sides.

Typical parapodia bear setæ of two kinds, the one elongated and

slender, the other short and stout, but both are essentially of the type found in the neuropodium of *Lepidonotus* and its allies, though the slender ones superficially resemble the notopodial form. Both kinds are colorless and vitreous. The former kind (fig. 7) are arranged in a spreading fan-shaped fascicle, and many of them are exceedingly long and slender, their total length equaling or exceeding the entire transverse distance between the tips of the parapodia. Very frequently the inner ends of those of the two sides of the body touch or even overlap in the coelom beneath the intestine, and their protruded portions reach beyond the parapodia to a distance equal to or even twice its length. For the greater part of their length they are smooth and of an even diameter, but at a point on the exposed part a variable distance from the end a more or less distinct enlargement occurs, beyond which the seta tapers very gradually into a fine, usually slightly curved tip, the convex margin of which is marked by a series of minute appressed scales. The length of this tip varies greatly even in setæ which are contiguous in the bundle. The shortest setæ of this kind occur in the ventral portion of the anterior bundles and the longest in the middle portion of the posterior bundles. The number is greatest in the middle somites and diminishes each way, the last parapodium having but one in this specimen.

The stout setæ (figs. 9 to 12) recall the form of those of *Scalesetosus*. They are 2 or 3 times as thick as the slender ones and very much shorter. Near the end is a rather abrupt enlargement, beyond which they taper somewhat irregularly into a short, somewhat hooked tip provided in newly formed setæ with a flexible appendage, which in most instances is quickly worn away. On the dorsal side of the thickening is a short transverse fringe, followed along the same or concave side of the tip by 4 or 5 pairs of delicate combs reaching about half-way to the tip. Almost invariably 3 stout setæ are found in the ventral part of the parapodium, and the dorsalmost one only is accompanied by a slender seta. On the first parapodium (II) are a few setæ of an intermediate type (fig. 8); the ventralmost one is the stoutest, the dorsal one most attenuated. The two kinds are well differentiated on III.

The alimentary canal is slender and thin-walled, with regular enlargements at the septa. A few degenerating ova in the coelom establish the sex. As indicated above the specimen is colorless and pellucid, with distinct pigment in the eyes only.

The only known specimen was taken in the surface tow-net, 70 miles southeast of Nomans Land, Massachusetts, on the border of the Gulf Stream, on July 31, 1902, along with *Salpæ*, several species of pteropods

and medusæ and other constituents of that strictly pelagic fauna. Though this locality is not strictly within the limits of the Woods Hole region it is frequently visited by expeditions sent out from Woods Hole by the U. S. Fish Commission, and members of its fauna are every summer carried into Vineyard Sound by favorable winds.

The discovery of a species of *Drieschia* in our waters is of exceptional interest, as the type and hitherto only known species of the genus was described by Michaelsen⁵ from the neighborhood of Ceylon, and has not been found since. Like the new species, it is pelagic and pellucid, but differs decidedly in specific characters. *D. pelagica* has 28 somites and 13 pairs of elytra; the palpi are as long as the tentacular cirri and $2\frac{1}{2}$ times the antennæ; the dorsal cirri are all alike and have very thick but short ovate ceratophores, and the stout setæ are strongly curved and of a quite different shape. The elytra have the same peculiar inflated character described for *D. pellucida*, though apparently less pronounced.

***Tomopteris helgolandica* Greef. ?**

Several specimens of a perfectly limpid species of *Tomopteris* were taken in the tow-net, lowered nearly to the bottom in 17 fathoms, at Crab Ledge, east of Chatham, Massachusetts, on August 19, and again on August 22, 1902. The same species was also taken at the surface at Woods Hole in July, 1903. Prof. Verrill has recorded the occurrence of the young of *Tomopteris* in Vineyard Sound,⁶ and an unidentified species of the genus from the Gulf Stream material collected by the *Albatross* in 1883.⁷ These appear to be the only published records of the capture of this interesting annelid in this region. Miss Katharine Bush has kindly compared one of my specimens with those from the Gulf Stream in the Yale Museum, and states that they are of the same species, a conclusion which I am enabled to confirm through Prof. Verrill's courtesy in sending to me an unpublished drawing of his species.

After a careful examination of the very considerable literature of the genus I am still in doubt concerning the identity of the Massachusetts examples. Notwithstanding Apstein's excellent monographic work,⁸ there are still wanted careful descriptions of the changes undergone by many of the species during growth and of the very considerable variations which occur among the mature worms, of the limits of which

⁵ *Mitteilungen Naturhis. Mus. Hamburg*, IX (1891), p. 6.

⁶ *Invertebrates of Vineyard Sound*, p. 332 (626).

⁷ *Rep. U. S. Fish Commission for 1883* (1885), p. 594.

⁸ *Aleciopiden und Tomopteriden der Plankton Expedition*.

but little is known. From all of the species which have been accurately described, with the single exception of that to which Greeff has given the name of *T. helgolandica*, the Massachusetts form is clearly differentiated. *T. helgolandica* it resembles closely in all of those technical characters, such as the distribution of rosette-organs and parapodial fin glands, the form of the parapodia, relative length of the cirri, etc., which have been most relied upon for the discrimination of species by the best students of this group—Apstein, Greeff and Vejdovsky.

On the other hand there are many minor points of difference, most of which are constant in the 8 specimens at hand, but which are of such a nature that they may be temporary or local, and not specific. The specimens vary in length from 6 mm., in one having 10 pairs of parapodia, to 18 mm., in one having 16 pairs of parapodia besides a caudal appendage of 3 mm. on which occur 8 additional pairs. These and the intermediate growth stages exhibit the changes in the proportions of cirri, etc., which have been described by Carpenter and others. In all except the largest example the rosette-organs are limited to a single one situated in the broad fin membrane near the apex of each ramus of the foot, exactly as in *T. helgolandica*, but the largest specimen only possesses the third one on the anterior side of the base of the neuropodia of the first and second feet, generally present in that species. In these the dorsal ramus of the parapodia (fig. 13) is the longer, while *T. helgolandica* is always figured as having the ventral ramus longer. The fin membranes and the neuropodial gland exhibit no differences. The 4th and 5th parapodia are the longest, and all except the first two have their finned ends turned sharply caudad. Differences in the shape of the prostomium, which has a more slender median part and longer horns, in the shape of the base of the second pair of cirri, which has an anterior shoulder, and a longer interval between the second pair of cirri and the first parapodia may be due to a different state of contraction of the preserved specimens. In all, excepting the second, of these respects the resemblance to the figures of *T. rolasi* Greeff is closer. The Woods Hole specimens were collected by Mr. Edwards, and were studied only after preservation in formaline, but no red or yellow pigment was apparent. The Crab Ledge specimens while alive had no red pigment, and the central body of the rosette-organs was brown and not yellow; moreover, these organs appear to have a less regular structure than in *T. helgolandica*, but for the study of these, as well as the lenses of the black-pigmented eyes, and the brain, fresh material is required.

In all of the specimens the alimentary canal largely fills the cœlom,

the muscular pharynx reaches nearly or quite to the first parapodium and, except in two or three, the proboscis is everted and has the shape of an elliptical dish. Ovaries are present in both rami of developed parapodia, arising from near the apex of the outer wall, and are actively proliferating spherical groups of ova and nurse-cells, many of which float freely in the cœlom. There is little indication of the predominance of one cell in each of these groups, so that none of the specimens shows evidence of approaching maturity.

From the foregoing it is evident that the specific identity of our species with that so well known from northern European waters under the name of *T. onisciformis* Eschscholtz is by no means certain. Greeff's name is employed in the belief that future more thorough knowledge of the species of this genus will probably justify it, though the grounds⁹ upon which he splits Eschscholtz's species into two and altogether abandons the latter's much earlier name¹⁰ are quite insufficient. Southern New England is within the already known geographical range of *T. helgolandica*. In the western Atlantic Apstein found it abundantly in the plankton taken off Newfoundland, and records it from as far south as the mouth of the Amazon river. *T. smithii* Verrill¹¹ from Eastport, Maine, is probably founded on adult examples of this species, and if the black spots shown at the bases of the parapodia of the West Indian *Tomopteris* figured by Agassiz¹² represent the nephridial pores, there is no apparent reason for considering that to be any other species. By far the most generally distributed species in the warmer parts of the western Atlantic, according to the records of the German Plankton Expedition, is *T. keferstinii*, but no American planktologist has recorded this from the surface fauna of the Gulf Stream. Andrews¹³ states that immature individuals of a *Tomopteris* resembling *T. rolasi* occur at Beaufort, North Carolina, but no description of them has been published.

⁹ *Zeit. f. wiss. Zool.*, XXXII, p. 264.

¹⁰ *Isis*, 1825, column 736, Pl. 5, fig. 5.

¹¹ *Proc. U. S. Nat. Mus.*, II (1879), p. 182.

¹² *Three Voyages of the Blake*, Vol. I, p. 192.

¹³ *Proc. U. S. Nat. Mus.*, XIV (1891), p. 300.

EXPLANATION OF PLATE LV.

Figs. 1 to 12.—*Drieschia pellucida*.

Fig. 1.—Dorsal view of entire worm with the elytra removed. $\times 11$.

Figs. 2 to 5.—Parapodia of somites X, IV, IX and XIV respectively, viewed from the posterior face, XIV only with the setæ. $\times 24$.

Fig. 6.—Front view of the proboscis, showing jaws and papillæ. $\times 56$.

Fig. 7.—One of the shortest of the slender setæ from the ventral margin of somite XIV. $\times 250$. *a*, a small portion of the same. $\times 440$.

Fig. 8.—Face view of a seta from the middle of the first parapodium (II). $\times 360$.

Figs. 9 to 11.—The tips of three stout setæ from somite X, 9 having the pennant-like tip, 10 the most ventral and 11 the most dorsal of the group. $\times 360$.

Fig. 12.—Face view of a stout seta with tip intact from somite XIV. $\times 360$.

Fig. 13.—Outline of a typical parapodium (V) of a medium-sized *Tomopteris* from Crab Ledge, showing the rosette-organs, *dr* and *vr*, the fin gland, *gl*, and the ovaries, *o*, the latter being represented diagrammatically. $\times 24$.